USGS
science for a changing world

Geographic Analysis and Monitoring Program

GAM Topographic Science Project

Statement of Problem

There is a growing scientific call for place-based ecosystem studies that incorporate a hydrologic understanding based on watershed analysis. Integrated studies need to recognize the natural behavior of both hydrologic and biologic resources. Many Federal agencies are being mandated to conduct their assessments within a watershed context. These requirements underscore the need for studies that develop hydrologic applications of topographic information.

Objectives

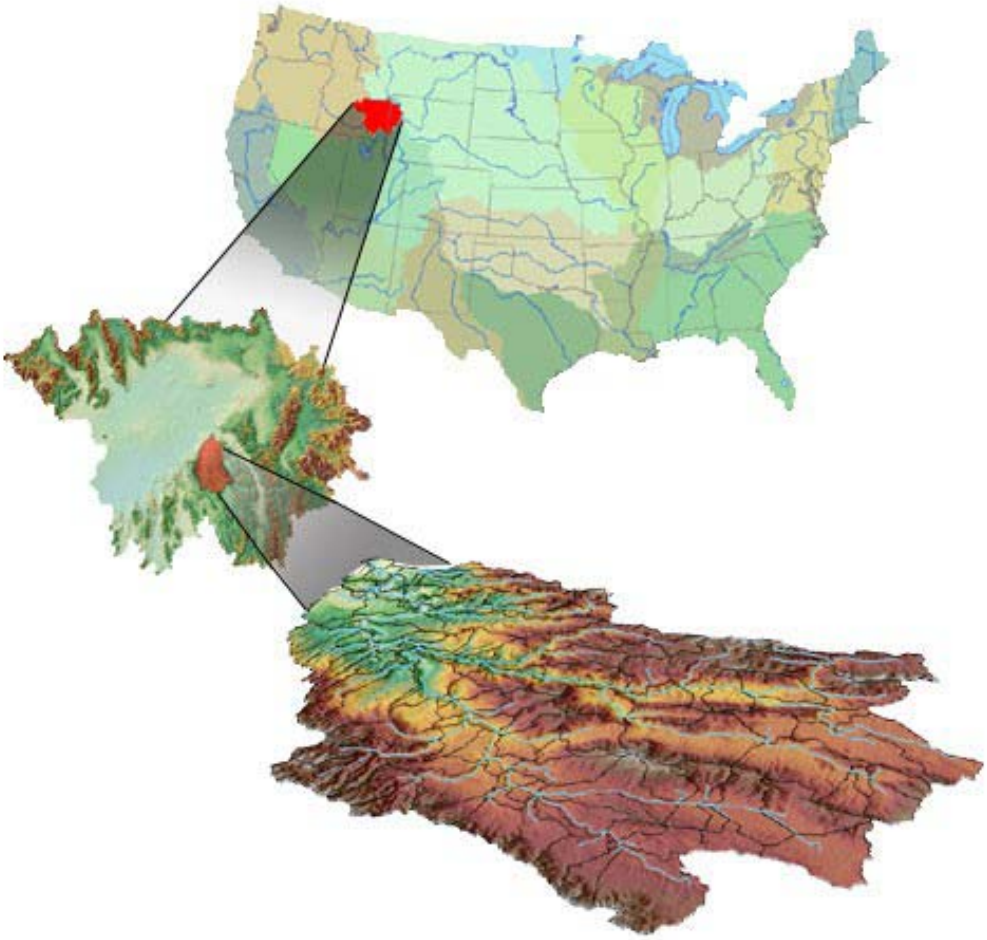
This project conducts watershed-based research and applications of topographic information in national and international geographic analysis and monitoring.

Relevance and Impact

The importance of watershed-based analysis has been recognized for integrated science, state and federal resource management, and homeland security. Much research and development are needed to adequately tie the characteristics of the landscape to a feature of interest, for example tying a drinking water intake to the land use in it's watershed or the erosion potential at a bridge location to the slope and soil characteristics of it's watershed. This research will support the answering of important national questions such as: "What is the spatial distribution of land cover in the watersheds of Big Rivers, and how is it changing?"

Strategy and Approach

The recently developed Elevation Derivatives for National Applications (EDNA, see edna.usgs.gov) database provides flow network relationships that connect the landscape and allow land cover and other data to be analyzed with respect to their hydrologic flow path within a watershed. An analysis approach will be developed that will integrate EDNA, land cover, and other variables to characterize Big Rivers of the conterminous United States. The project will be conducted in partnership with several federal agencies. The project consists of tasks, which conduct research and development, and applications analysis in selected watersheds.



This figure illustrates the granularity with which EDNA is able to tessellate the landscape.

Task 1: Watershed-Based Analysis - Big Rivers are a topic of increasing priority to the national programs of USGS, EPA, and others. This priority is driven by important science questions such as nutrient transport's role in hypoxia, and also by organizational challenges such as developing common Big River management processes involving multiple states. Geographic analysis of Big Rivers poses unique challenges unmet by existing techniques for analyzing wadeable streams and smaller geographic areas. The land cover present in the drainage area of a Big River is critical, however the hydrologic landscape connectedness is needed to adequately characterize the spatial distribution of land cover and other spatial characteristics. The recently developed Elevation Derivatives for National Applications (EDNA) database provides flow network relationships that connect the landscape and allow land cover and other data to be analyzed with respect

to their hydrologic flow path within the watershed. An analysis approach will be developed that will integrate EDNA, land cover, and other variables to characterize Big Rivers. Working with partners, the approach will be used to characterize the Big Rivers of the conterminous United States.

Task 2: EPA/Applications - This task encompasses the work agreed to under an Interagency Agreement between USGS and EPA. FY2003 is the third year of the agreement. The general focus of deliverables is the building of capabilities for hydrologic information extraction from elevation data for the United States, and integration of elevation data with land cover and other data for ecological studies. During FY2003 the EPA work will be focused on the Lake Michigan watershed.

Task 3: USGS Water Discipline – The USGS Water Resources Discipline has collaborated with EDC through reimbursable agreements for many years in the focus area of topographic information extraction. This task will encompass those collaborations.

For More Information

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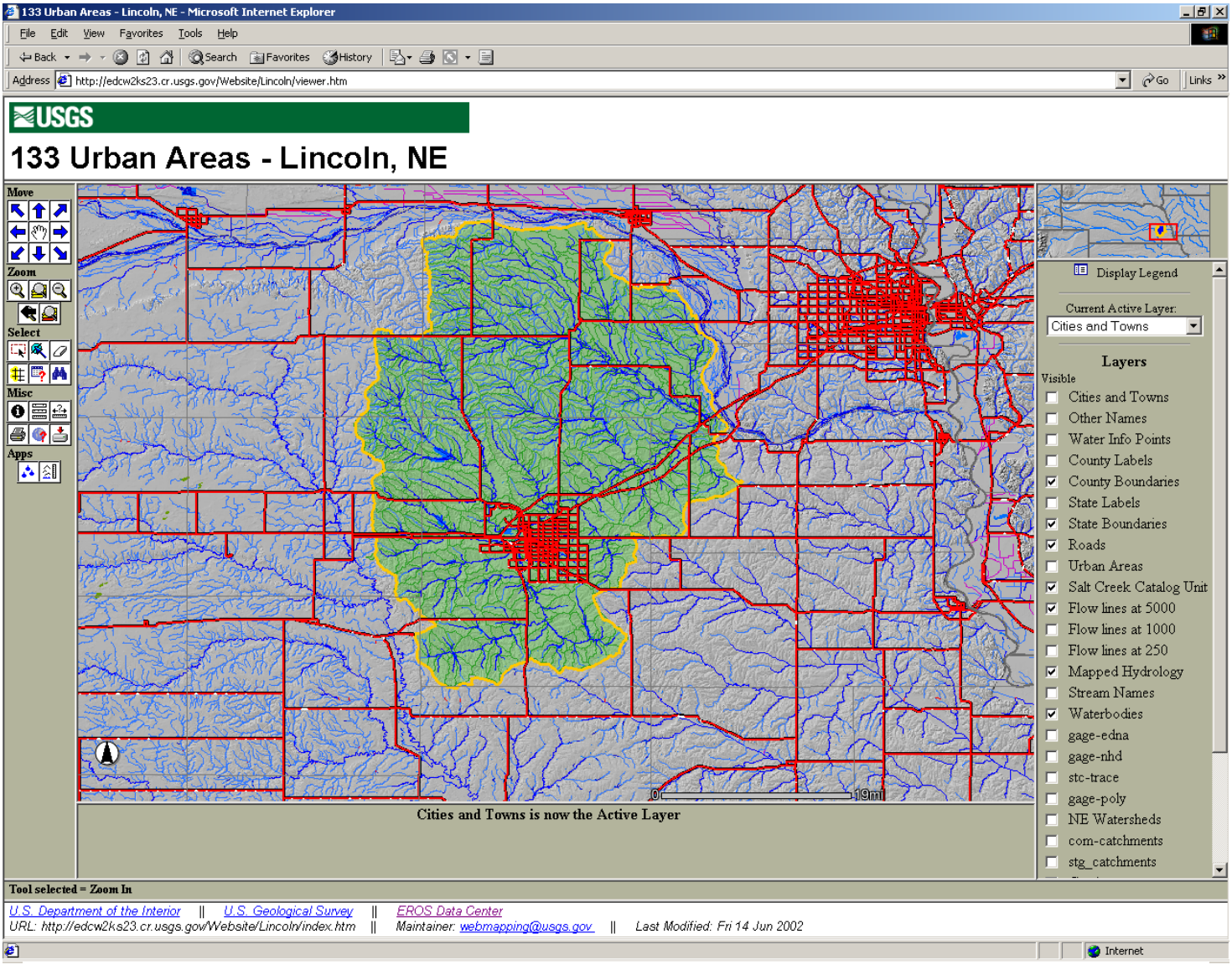

This figure illustrates a homeland security-related analysis using EDNA for Lincoln, Nebraska.